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ABSTRACT

This study is an empirical analysis of urban employment changes in the United States between 1980 and 1984. The paper follows other recent work on the economics of urban and regional employment growth. Particular attention is paid to the effects on employment of schooling attainment and per pupil schooling expenditures. In addition, the effect of relatively high concentrations of black employees is studied. The paper is divided into four sections. The first section presents a brief theoretical framework. The second section discusses the empirical models and data. The third section reviews empirical results of the study. The fourth section presents some brief observations on employment growth in semi-urban counties. Results indicate that jobs are generated disproportionately in urban areas that have a higher quality human infrastructure as reflected by educational attainment and per pupil expenditures. A relative increase in the black population is shown to have a negative effect on employment. The study also indicates that the South appears to be gaining jobs relative to the rest of the United States. Results suggest that schooling may not contribute significantly to growth in rural areas. The study includes 12 formulae and statistical data on three tables. A list of eight references is appended. (AF)

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SCHOOLING AND URBAN EMPLOYMENT GROWTH: 1980-1984

by Peter V. Schaeffer and William Sander

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Peter F. Nardulli, Editor

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SCHOOLING AND URBAN EMPLOYMENT GROWTH: 1980-1984

This study is an empirical analysis of urban employment changes between 1980 and 1984. The paper follows other recent work on the economics of urban and regional employment growth in the United States [1,2,3,5,7,8].

Particular attention is paid to the effects of schooling attainment and schooling expenditures on employment. In addition, attention is also given to the effect of relatively high concentrations of Blacks on jobs.

It is shown that for counties that are at least ninety-percent urban, both schooling attainment and per pupil schooling expenditures increase employment growth. An increase in percent Black is shown to reduce the rate of employment growth. Also, it is demonstrated that the industry mix in a county in 1980 affected employment changes since 1980 and that counties in the South generated more jobs, other things being equal.

The paper is organized as follows: First, a brief theoretical framework is presented. Second, the empirical models and the data are discussed. Third, the empirical results are reviewed. Fourth, a note on employment growth in semi-urban counties is presented. The paper closes with an assessment of the findings.

THE THEORY

Why does one region's employment grow at a rate different from that of another region? Neoclassical economic theory suggests that, ceteris paribus, there exists a positive relationsnip between the quality of a factor of production and the extent to which this factor is employed. In particular, it states that the level of employment is positively related to the quality of a region's labor forces. This insight from static theory is extended to explain employment changes over time.

Schooling provides the foundation for the effective acquisition of job skills. A well-educated labor force is able to learn new skills and perform

new tasks relatively easily. It has the potential to adjust to, and benefit from, changing economic conditions. We, therefore, expect that public spending on education and employment growth are positively correlated. This positive relationship is weakened if workers display a high degree of mobility. A region may lose some of its human capital investment to other regions, or it may benefit from educational spending by other regions through immigration or commuting. The geographically smaller the region, the more likely it is that such spillovers are significant.

Many workers have families with children and they are concerned about the quality of a region's educational system. Parents may be willing to forego a promising job opportunity if it requires a move that may be detrimental to their children's education. Thus, regions that have a strong educational system are expected to be at an advantage in attracting workers. Firms recognize this and tend to favor the same regions as it is easier for them to attract and keep workers.

In determining a region's success at achieving employment growth there are, therefore, three major groups of decision makers to be considered: governments because they determine the quality and cost of the educational services as well as other public services, firms, and workers or households. The relationships among these sectors will now be presented.

Households are assumed to pick the location that affords them the greatest utility. For all households the utility index is a function of consumption and the quality of educational services. Households are divided into two types: there are M number of minority households and N number of non-minority (white) households. The subscripts M and N, respectively, will denote variables relating to these two types of households. This distinction is made mainly to generate hypotheses about possible discrimination against

minority households by white households, and the possible impact that this might have on employment growth in regions with a high percentage of minorities. For this reason, a variable $m_i = M_i/N_i$ is defined, where i denotes the region. The utility functions for households are assumed to display the following characteristics.

$$(1)\quad \begin{aligned} &(a)\ U_{Ni} = U_N[C_{Ni}, E_i, m_i],\ U_{NC} > 0,\ U_{NE} > 0,\ U_{Nm} \leq 0; \\ &(b)\ U_M = U_M[C_{Mi}, E_i],\ U_{MC} > 0,\ U_{ME} > 0. \end{aligned}$$

C_{Ni} and C_{Mi} denote the consumption of both types of households, respectively, E_i is a measure of the quality of educational services, and U_{NC}, etc., denote the partial derivatives of the utility function. Consumption must be distinguished by type of household because discrimination in the labor market may lead to different average consumption patterns. If $U_{Nm} = 0$, then discrimination is absent between households.

Each household pays for its consumption out of its after-tax income. The labor supply of the household is fixed and the household taxes are assumed to be proportional to wage income. Taxes paid by households are denoted T_{Hi}, the tax rate is t_{Hi}, and prices are given by the vector p_i.

$$(2)\quad \begin{aligned} &(a)\ p_iC_{Ni} - (1-t_{Hi})W_{Ni} = 0 \\ &(b)\ p_iC_{Mi} - (1-t_{Hi})W_{Mi} = 0 \end{aligned}$$

W_{Ni} and W_{Mi} are the expected wages for white and minority households, respectively. It is assumed that discrimination at the workplace does not take the form of wage discrimination. That is, all workers get paid a wage of W_i. Differences between W_{Ni} and W_{Mi} are attributable only to differences in the probability of obtaining a job.

Migration of households is a function of the relative utilities that can

be obtained at different places. Nij and Mij are the number of white and minority migrants from region i to region j, respectively. Nii and Mii denote those households who do not move. The formulation does allow for simultaneous movement from i to j and from j to i. The probability of a move increases with the gap in the utility levels between regions.

(3) (a) $N_{ij} = f_N(U_{Nj} - U_{Ni})$, $f_N' > 0$

(b) $M_{ij} = f_M(U_{Mj} - U_{Mi})$, $f_M' > 0$

Firms are assumed to be price takers. Their joint production activities can be described by a production function. There are two inputs: capital and labor. Capital markets are assumed to be equally accessible everywhere. Interregional differences in employment growth can, therefore, be attributed only to the quality and availability of the input labor. The quality of labor is denoted by a measure A_i (educational attainment).

The higher the attainment level A, the more productive the regional work force. The factor by which labor productivity increases is given by the function $g(A_i)$, $g_A > 0$, $g_{AA} < 0$. It is assumed that there is no difference in average skill levels between minority and non-minority households. Firms, however, may discriminate against minority workers. The production function expresses discriminatory practice by the parameter d_i.

$$(4) \quad Q_i = Q[K_i, (N_i + d_i M_i)g(A_i)], \quad 0 \leq d_i \leq 1$$

If $d_i = 0$ we have total discrimination; a minority worker would never be hired. If $d_i = 1$, then firms make no distinction between minority and non-minority workers. If it is assumed that Q[.] is a Cobb-Douglas function homogenous of degree one, then it is easy to show that the total demand for labor in equilibrium is

$$(5) \quad N_i + d_i M_i = [K_i/g(A_i)][(p_i/W_i)(1-a)g(A_i)]^a$$

Note that the assumptions imply that $(1-d_i)M_i$ minority workers will be unemployed if $d_i > 0$ and if minorities must be paid the same wages as non-minorities. Hence, the expected wage of a white household is $W_{Ni} = W_i$; that of a minority household is $W_{Mi} = d_i N_i + (1-d_i)Z_i$, where Z_i is the transfer payment received by a household which is not able to support itself through work. It is assumed that $Z_i < W_i$.

Government finances its expenditures, G_i, out of taxes levied from households, $t_{Hi}W_i(N_i+d_iM_i)$, and from capital owners, $t_{ki}r_iK_i$, where r_i is the before-tax rate of return.

$$(6) \quad G_i = t_{Hi}W_i(N_i+d_iM_i) + t_{ki}r_iK_i$$

It is assumed that the quality of regional educational services is a function of government expenditures on education. Let e_i be the fraction of all government expenditures that are allocated to education. Then,

$$(7) \quad E_i = E(e_iG_i).$$

The attainment level A_i is the result of past educational spending and migration. Migration will improve A_i if newcomers from regions with better educational systems are in the majority; A_i will decline otherwise. Denote the quality of the educational system in the past by E_{-1i}. The subscript -1 signals a previous period. E_{-1j} enters as a parameter.

$$(8) \quad A_i = A\left[\sum_{j=1}^{J}(N_{ji}+M_{ji})E_{-1j}\right]$$

From these relationships several hypotheses can be derived. Current education expenditures affect migration behavior. Regions with high

educational spending (high educational quality) are more attractive to households than other regions, ceteris paribus. This allows for some trade off between wages and households without a loss in a region's ability to retain and attract labor. The possibility of discrimination and prejudice against minorities complicates the effect of educational spending, however.

$$(9)\quad \begin{aligned} &(a)\ dU_{Ni}/dE_i = (\partial U_{Ni}/\partial C_{Ni})dC_{Ni}/dE_i + \partial U_{Ni}/\partial E_i + (\partial U_{Ni}/\partial m_i)\partial m_i/\partial E_i \\ &(b)\ dU_{Mi}/dE_i = (\partial U_{Mi}/\partial C_{Mi})dC_{Mi}/dE_i + \partial U_{Mi}/\partial E_i \end{aligned}$$

We expect the effect of education on wages to be positive; hence, the effect of education on consumption should be positive, too. The first two terms in (9.a) and (9.b) are, therefore, positive. The effect of prejudice against minorities on the part of white households can be positive or negative, depending on the relative effect of a change in educational quality on the migration of white versus minority households. If minority households are more responsive to increases in E_i, then $\partial m_i/\partial E_i > 0$. In that case, the last term in (9.a) is negative and the positive direct effects of education on the utility of white households are partly offset by the increased presence of minority households. The total effect of education is then indeterminate. If, on the other hand, $\partial m_i/\partial E_i \leq 0$, then the last term is zero or positive and the total effect is positive. For minority households, the effect of an increase in E on their utility is always positive. We expect the effect of educational quality on households to be positive. Regions with a high quality educational system should find it easier to maintain their labor force. Firms in such regions have a competitive advantage, ceteris paribus, because a higher level of E_i can compensate for somewhat lower wages (lower consumption level C_i). They may also have the choice among more applicants from other regions and can, therefore, hire those who have received the best education available.

This will increase the attainment level A_i and, hence, productivity.

Taxes have a negative effect on firms and on households because they reduce profits and disposable income, respectively. If taxes are used to increase educational quality, then the negative effect is opposed by the positive effect of education. Similar relationships are likely to exist between taxes and other services they finance. The effect of taxes can therefore be estimated only if corrections are made for the level and quality of public services.

The presence of minorities is expected to have a negative effect on employment growth if $0 \leq d_i < 1$. In that case $(1-d_i)M_i$ minority households require some form of public assistance. This requires taxes that yield no benefits to firms or white households to offset the negative effect of taxes on profits and utility levels. This effect is compounded if $U_{Nm} < 0$.

Prices (p_i) have a positive effect on the demand for labor. Regions that produce a large share of goods for which demand is increasing or stable are, therefore, at an advantage over regions whose industries encounter weak demand. Assuming that the industrial structure of a region can change only slowly, this implies that the inherited industry mix effects short-run and medium-run employment growth.

THE MODEL AND DATA

Following our conceptual model and previous research, empirical models are specified to estimate (1) the rate of employment growth and (2) the relative differential shift in county employment growth between 1980 and 1984. The differential shift is an estimate of the impact of differences in industry-by-industry performance between a single county and the United States. A superior (inferior) performance of the county's industries will lead to

greater (smaller) employment growth than would be expected on the basis of the county's industry mix in 1980. Thus, in the second specification we look for explanations of why county industrial performances differ from the national trends for those industries.

In case one, when we estimate county-level employment change, we have to adjust for the industry mix in 1980 because this is expected to affect the rate of employment change. In the second case, the differential shift shows county-by-county deviations from the national trend net of any industry mix effect. Thus, in the first case, we adjust for the industry mix effect on the right-hand side of the equation; the adjustment is made on the left-hand side in the second case. The second approach is based upon the shift-share methodology that we shall briefly review.

Because counties are open economies, their performance depends on events and trends over which they have little influence. Within the United States, it is reasonable to assume that urban county economic performance is somewhat correlated with the performance of the national economy. The growth rate of the urban economy may, therefore, be compared to that of the United States. Take urban employment in the base year (t=0) and multiply it by 1 plus the national growth rate between t=0 and t=1. Subtract the result from the observed actual employment of the county at t=1. If the county grew at a rate above that of the country as a whole, this difference is positive. It is zero if the growth rates coincide, and negative if the county was lagging. In the language of shift-share analysis, this difference is referred to as the total shift. The formula for the total shift is given by equation (9). L denotes employment. The superscripts 0 and 1 denote the base and the ending year, respectively, and the subscript s stands for state, and n for nation.

$$(10) \quad S_s = L_s^1 - \left[L_n^1 \Big/ L_n^0 \right] L_s^0$$

The purpose of shift-share analysis is to separate two different effects that together make up the total shift. The first effect indicates that if a county's employment base is dominated by industries that have slow national growth rates, then one expects that county to grow relatively slowly, too. The second effect is a product of the performance of a county's industries relative to that of the same industries in the comparison region. A particular industry may grow slowly (quickly) at the national average, but it may grow quickly (slowly) in the county. Shift-share analysis provides formulas that describe these two separate effects. For a derivation of the formulas, see (6).

The differential performance of a county's industries from the same industries at the national level is given by equation (10). The additional subscript i denotes industries. Otherwise, all symbols retain their meaning.

$$(11) \quad D_s = \sum_{i=1}^{I} \left(L_{is}^1 - \left[L_{in}^1 \Big/ L_{in}^0 \right] L_{is}^0 \right)$$

It is clearly seen that the differential shift D_s is nothing but the same comparison that was made for the total shift on an industry-by-industry basis. The industry results are then added up to give the number of jobs that the county gained (lost) between t=0 and t=1 due to superior (inferior) performance of its industries compared to the average performance of these industries for the United States.

The industry mix effect, referred to as the proportionality shift, can be obtained as the difference between S_s and D_s. The formula for the industry mix effect is

$$(12) \quad P_s = \sum_{i=1}^{I} \left(\left[L_{in}^1 / L_{in}^0 \right] - \left[L_n^1 / L_n^0 \right] \right) L_{is}^0$$

The formula uses the difference between industry growth rates at the national level and the average U.S. growth rate. P_s is negative (positive) if the county's employment base is mostly in slow (fast) growth industries.

The value of shift-share analysis for our analysis is clear. It allows us to separate industry mix effects from other reasons for a county's differential employment growth. The theoretical analysis suggests that counties may experience differences in employment growth for a variety of reasons. One of these reasons, the one that is of particular interest here, is education. By taking out the effect of the industry mix, the empirical analysis should yield stronger results on the impact of other factors.

Thus, apart from adjusting for the industry mix effect, we also adjust for schooling attainment and schooling expenditures in 1980. Schooling attainment is measured as the median years of schooling completed by the population age twenty-five years and older. Schooling expenditures are measured as per pupil expenditures in primary and secondary schools. The natural log of expenditures is used in our estimates because of the probable diminishing effect of expenditures on output.

Schooling attainment is used as a proxy for the quality of the human infrastructure while schooling expenditures are used as a proxy for schooling quality. While both measures leave much to be desired [4], they enable us to gauge, albeit imprecisely, some of the effects of human capital on urban employment.

An adjustment is made for the percent Black in a county in 1980. Previous research [2] indicates a positive Black effect on regional growth.

However, there is a basis for expecting either no effect or, perhaps, a negative effect. First, because of discrimination, firms may be less likely to locate in relatively Black counties. And second, because many Blacks only have access to low-quality schooling, a negative Black effect on employment may reflect, in part, the consequences of poor schooling on human capital accumulation.

An adjustment is also made for local taxes per capita in a county. This variable is less than precise for two reasons. First, state taxes which are relevant are not included. And second, no account is taken of the incidence of the tax which may be relevant. The effect of this variable cannot be predicted because it may both contribute to and detract from a county's business climate.

Adjustments are also made for the median age in a county and population size, although the effects of these variables cannot be predicted. Finally, dummy variables are created for counties in the West and the South because of the reallocation of markets to the so-called "Sunbelt."

The data are for counties that were at least ninety-percent urban in 1980. Of the 128 counties in this class, 113 observations are used. Several urban counties had to be excluded because of the lack of detail on employment. The data on employment are taken from County Business Patterns 1980 and County Business Patterns 1984. The other data are taken from the County and City Data Book 1983. Summary statistics are provided below (Table 1).

The Results

OLS estimates of urban employment growth between 1980 and 1984 indicate that percent Black has a negative effect and schooling attainment and schooling expenditures have positive effects (Table 2). In addition, counties with a more favorable industry mix generated more employment, as one would expect.

Our results also indicate that although "West" had no effect, counties in

Table 1

Summary Statistics for Data Set

	Mean	Standard Deviation
Urban Counties		
1. Employment growth, 1980-84	8.3%	11.1
2. Differential employment shift, 1980-84	3.2%	10.7
3. Industry mix effect, 1980-84	.8%	1.9
4. Black, 1980	13.5%	12.0
5. Median schooling, adults 25+, 1980	12.7 years	.6
6. Schooling expenditures, 1980	$1,191/pupil	364
7. Taxes per capita, 1980	$387	173
8. Median age, 1980	30.4 years	3.5
9. Population, 1980	762 (000)	922 (000)
Semi-Urban Counties		
10. Employment growth, 1980-84	-1.3%	10
11. Differential employment shift, 1980-84	-3.2%	9.3
12. Industry mix effect, 1980-84	-2.2%	2.4
13. Median schooling, adults 25+, 1980	12.3 years	.1
14. Schooling expenditures, 1980	$1,136/pupil	243
15. Taxes per capita, 1980	$209	60
16. Median age, 1980	29.7 years	2.0
17. Population, 1980	22 (000)	13 (000)
18. Farm population, 1980	8.6%	5.0

Table 2

Estimates of Urban Employment Changes, 1980-1984
(t-statistics in parentheses)

	Growth	Differential Shift
Black	-.34***	-.35***
	(4.2)	(4.1)
Schooling attainment	5.17***	5.28***
	(3.1)	(3.1)
Schooling expenditures	1.31**	1.50**
	(2.0)	(2.3)
Taxes	.002	.002
	(.3)	(.3)
Age	.24	.22
	(1.0)	(.9)
Industry mix	1.28**	
	(2.5)	
Population	-.001	-.001
	(1.2)	(1.0)
West	2.93	2.58
	(1.2)	(1.1)
South	8.18***	8.97***
	(3.3)	(3.6)
Intercept	-73.6	-79.9
$\bar{R}^2$	.41	.33

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

the "South" generated more jobs, other things being equal. The same patterns in our results were found for the differential shift, as well.

A NOTE ON NON-URBAN GROWTH

Because of externalities, the determinants of non-urban growth may differ from the factors that bear upon urban development. Although it is beyond the scope of this paper to treat this topic in depth, we estimated employment growth in counties that were forty- to fifty-percent urban and counties that were one hundred-percent rural in the East North Central region.

For the counties that were forty- to fifty-percent urban (called "semi-urban"), we excluded percent Black because of the paucity of Blacks and we added percent in farming because of financial stress in agriculture during the study period. All of the other variables follow our urban estimates. Summary statistics are provided above (Table 1).

Our results indicate that age had a negative effect and a more favorable industry mix increased jobs (Table 3). All of the other coefficients were insignificant. For the rural counties (results not shown) none of the coefficients were significant.

Conclusions

Our results indicate that jobs are being generated disproportionately in urban areas that have a higher quality human infrastructure as indicated by schooling attainment and schooling expenditures. In addition, we find that a relative increase in the Black population has a negative effect on employment. Our study also indicates that the South appears to be gaining jobs relative to the rest of the United States.

Finally, we found that schooling may not contribute significantly to growth in rural areas. However, this is not to say that schooling is necessarily a less efficient investment in rural areas. Rural parents undoubtedly value schooling as much as their urban counterparts.

Table 3

Estimates of Semi-Urban Employment Changes, 1980-1984
(t-statistics in parentheses)

	Growth	Differential Shift
Schooling attainment	-8.89 (.9)	-6.04 (.6)
Schooling expenditures	.14 (.02)	-.14 (.02)
Taxes	-.01 (.2)	-.01 (.3)
Age	-2.15*** (3.0)	-2.14*** (3.0)
Industry mix	1.64*** (3.1)	
Population	.11 (.9)	.08 (.7)
Farmers	.31 (1.0)	.17 (.6)
Intercept	171.0	134.3
$\bar{R}^2$	.27	.13

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

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